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# PATENT SPECIFICATION

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## (54) APPARATUS FOR THE GRAVITY CONCENTRATION OF MINERALS

(71) We, ANGLO AMERICAN CORPORATION, of South Africa Limited, a Company registered according to the laws of the Republic of South Africa, of 45 Main Street, Johannesburg, Transvaal, Republic of South Africa, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This specification relates to the gravity concentration of minerals.

One method of gravity concentration which is of very ancient origin is to transport a material along a long, relatively narrow trough by means of water. In the base of the trough there may be riffles or a blanket of some kind. Heavy material settles on the base. The base is cleaned out periodically where fixed riffles are used or the blanket is removed and replaced periodically where blankets are employed. Either way the flow of material has to be stopped or diverted in order to get at the concentrate.

An object of the invention is to do away with the need of stopping or diverting the flow of material.

According to the invention gravity concentration apparatus of the sluice box type comprising a trough along which water-borne material can flow in the direction of a flow axis, and a base to the trough shaped to receive and hold settled material, is characterised in that the base of the trough forms part of a belt that is movable transversely to the flow axis.

The belt may pass through a cleaning station where concentrate is removed.

The belt could move intermittently, but preferably moves at a predetermined reasonably slow speed.

The invention further provides that the belt be formed with riffles of a suitable configuration. One such configuration consists of parallel elongated riffles parallel to the long axis of the trough or at a suitable

angle thereto the riffles having triangular shapes.

Another configuration consists of parallel riffles with flat right angled crowns and troughs of a similar shape. The riffles may in the latter case be slats attached to a flexible sheet, but in that case the slats must be parallel to the axis of the trough.

Further according to the invention the side walls of the trough are defined by idler rollers under which the belt passes upwardly to form extensions to the side walls.

The invention is further discussed with reference to the accompanying drawings, in which

Figure 1 is a perspective view of apparatus according to the invention,

Figure 2 is an end view of Figure 1,

Figure 3 is an enlarged section of a belt,

Figure 4 is a view similar to Figure 3 of another type of belt, and

Figure 5 is a view similar to Figure 2 of another embodiment.

In Figures 1 and 2 a belt 4 passes over a series of rollers 5 to 10 arranged as shown, the rollers 5 and 8 being driven. Between the rollers 6 and 7 the belt 4 forms a false floor above a fixed floor 11. Together with that belt section that lies between them the rollers 6 and 7 define a trough of a strake. Material to be concentrated is fed in through an inlet 12 and runs off into an outlet 13.

The belt 4 runs in the direction of the arrows in Figure 2. It has on its upper surface a series of riffles 14. As shown in Figure 3 the riffles on their leading edges (i.e. on the left) make an angle of 90 degrees with the belt plane and on their trailing edges an angle of 20 degrees with the same plane. The belt is conveniently moulded from suitably reinforced rubber. As shown the riffles 14 run parallel to the direction of material flow. In a suitable case they can be at an angle biased towards the direction of movement of the belt.

In use the belt runs in the direction as

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5	shown at a speed of, say, 6 inches a minute. At the roller 9 there is a water spray 15 arranged to clean the belt. Material from the belt falls into a concentrate launder, which may be compartmentalised in the longitudinal direction. The material to be concentrated flows from inlet 12 to the outlet 13 at about 5 to 6 feet per second and seldom at a speed of more than 10 feet a second.	described above or partly discontinuous over the magnetic zone.	55
10	When used on a South African gold ore, the apparatus separated about 55% of the gold by gravity concentration. Thus the load on the cyanidation circuit was considerably reduced due to the lesser quantity of gold to be dissolved and also due to the fact that coarse gold particles were removed and thus the residence time for complete dissolution was reduced.	If the rollers 6 and 7 are mounted on movable bearings they may be adjusted sideways to increase the width of the trough. In this case one other roller must be adjustable to take up any slack in the belt 4 or to give slack where necessary.	60
15	When used on a South African gold ore, the apparatus separated about 55% of the gold by gravity concentration. Thus the load on the cyanidation circuit was considerably reduced due to the lesser quantity of gold to be dissolved and also due to the fact that coarse gold particles were removed and thus the residence time for complete dissolution was reduced.	WHAT WE CLAIM IS:-	65
20	As an alternative to Figure 3 the riffles could take the form shown in Figure 4. In this case the riffles are flat-topped and the configuration is a castellated one in section.	1. Gravity concentration apparatus of the sluice box type comprising a trough along which waterborne material can flow in the direction of a flow axis, and a base to the trough shaped to receive and hold settled material, characterised in that the base of the trough forms part of a belt that is movable transversely to the flow axis.	70
25	In the Figure 4 configuration the riffles could be formed of a moulded material or they could be provided by slats secured to a flexible backing. In the former case the riffles (as in the Figure 3 configuration) could run at any suitable angle to the axes of the rollers. In the latter case the slats must be parallel to those axes to enable them to get around the rollers.	2. The apparatus claimed in claim 1 in which the belt passes through a cleaning station where concentrate is removed.	75
30	The apparatus of the invention could be used for concentrating heavy minerals other than gold.	3. The apparatus claimed in claim 2 including means for moving the belt intermittently or continuously.	80
35	Thus it could be used for the recovery of diamonds. In this case the riffles probably have to be deeper and/or the roll 7 will be indented in a suitable fashion to allow for the passage of stones of the right size.	4. The apparatus claimed in any of the above claims in which the base is formed with riffles.	85
40	In a further development of the invention (Figure 5) the floor 11 extends upwardly to the left adjacent the belt 4. Powerful magnets or electromagnets 15 are mounted towards the forward end of the trough under the floor 11 and adjacent its extension, tramp iron in the material being treated at the forward end of the trough. In this case the roller 8 is also magnetized towards its forward end to ensure carry over of the tramp iron. To allow pieces of tramp iron to pass the roller 7 is indented as	5. The apparatus claimed in claim 4 in which the base has parallel, elongated riffles.	90
45		6. The apparatus claimed in claim 5 in which the riffles are triangular.	95
50		7. The apparatus claimed in claim 5 in which the riffles have flat right angled crowns with troughs between them of a similar shape.	
		8. The apparatus claimed in any of claims 5 to 7 in which the riffles run parallel to the long axis of the trough.	
		9. The apparatus claimed in any of claims 5 to 7 in which the riffles run at an angle to the axis of the trough.	
		10. Apparatus substantially as herein described with reference to Figures 1 to 3, Figures 1, 2 and 4, or Figure 5.	

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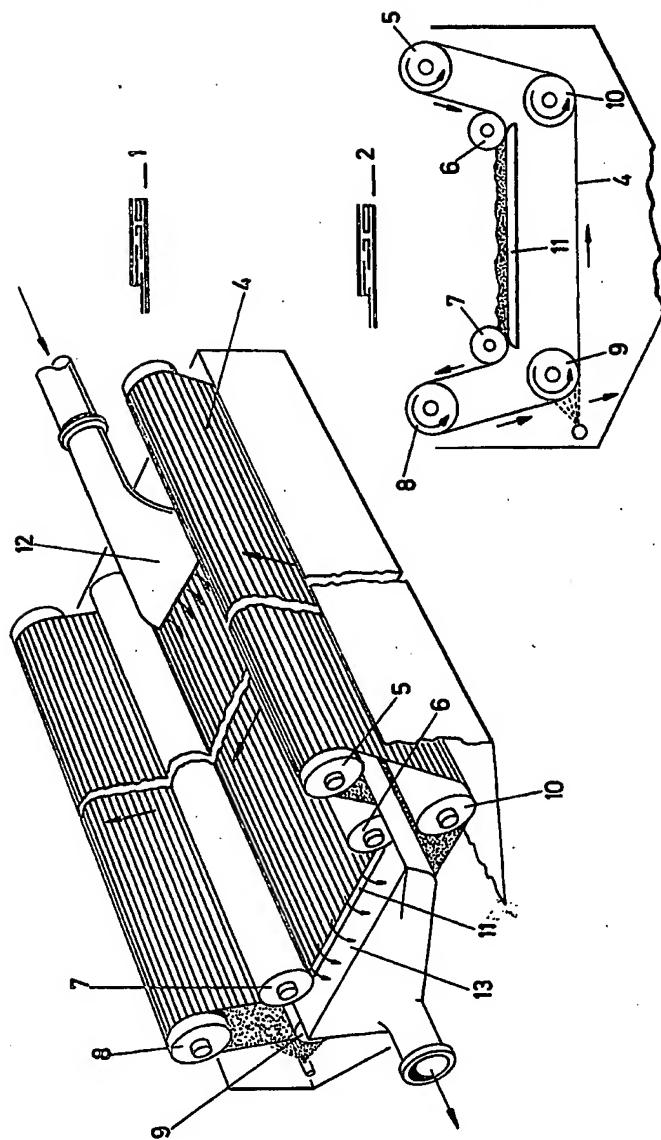
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2 SHEETS

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the Original on a reduced scale*

Sheet 1



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Sheet 2

